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Chapter 5.9 Weather Safety

This could be you . . .

An employee was struck by lightning while removing rain panels from the roof of a NASA trailer in preparation for moving the trailer to another location. After initially refusing to seek medical care, later in the day he began to feel worse and finally went to a hospital emergency center. The employee was admitted to the hospital overnight and subsequently remained off work for about 2 weeks recovering from the event.

Debris from a construction site damaged several cars when a severe thunderstorm came through the JSC area. A severe thunderstorm warning had been issued about an hour before the incident.

5.9.1 Applicability of this chapter

5.9.1.1 You are required to follow this chapter if:

- a. You work at JSC or a JSC field site as a civil servant or contractor employee.
- b. You are a line manager, facility manager, or contractor safety representative. Paragraph 5.9.9 of this chapter lists your responsibilities.
- c. Paragraph 5.9.9 of this chapter also lists the responsibilities of the Safety and Test Operations Division, contracting officers, and contracting officers' technical representatives.

5.9.2 Basic requirements for weather safety

5.9.2.1 When there is doubt about the potential for adverse weather conditions, adopt a conservative approach and assume the presence of adverse weather conditions. You need to be aware of and know what specific actions are required to be taken for your immediate area when notified of adverse weather conditions. You are responsible for your own safety. When approved site or task-specific weather safety policies conflict with this chapter, the task or site-specific instructions take precedence. When there is no site or task-specific instruction, this chapter applies. Coordinate any task or site-specific instructions with the Safety and Test Operations Division. Each JSC organization needs to have a plan for limiting operations when weather conditions present a hazard to personnel or equipment (See paragraph 5.9.7 of this chapter for group events). The plan shall:

- a. Identify weather limits for safe operations based on the time required to safely terminate an operation, the operation's risks, and the operation's location.
- b. Designate individuals responsible for monitoring weather conditions. These individuals are responsible for:
 - (1) Notifying the organization's members when adverse weather conditions are occurring or are expected to occur

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(2) Monitoring the weather at their local jobsite or contacting the Spaceflight Meteorology Group* (SMG) for guidance

- c. Provide instructions for the safe termination of operations and sheltering for personnel and special high-value equipment when adverse weather conditions are anticipated.

*NOTE: The JSC SMG monitors local JSC weather weekdays from 8:00 a.m. to 4:00 p.m. Central time (except federal holidays) and issues weather advisories for the specific criteria listed below. The SMG issues advisories via the JSC Emergency Notification System (JENS), which posts to the JSC internal home page and distributes e-mails to Emergency Planning Representatives and key personnel for redistribution. The SMG can also assist an organization in monitoring adverse weather conditions in response to specific queries. SMG issues JSC weather advisories for the following:

- Lightning within 6 miles of JSC
- Severe thunderstorm, tornado, and flash flood watch or warning for Harris or Galveston County
- Surface wind gusts greater than 58 mph
- Freezing temperatures or precipitation
- Excessive heat
- Tropical storm or hurricane watch or warning for Harris or Galveston County

5.9.3 Lightning

5.9.3.1 Lightning is second only to floods in the number of weather-related deaths that are caused each year. Generally speaking, if you can see lightning or hear thunder, you are already at risk of a lightning strike. Lightning can strike as many as 10 miles away from the rain area in a thunderstorm. That's about the distance that you can hear thunder. High winds, rainfall, and cloud cover are often precursors to actual cloud-to-ground strikes, alerting you to take action. Many lightning casualties occur as the storm approaches or after the storm appears to have passed. Don't be fooled by sunshine or blue sky! At JSC, you shall follow this policy:

- a. Consider lightning to be occurring in the JSC area if any of the following occurs:
- (1) You observe lightning and hear the associated thunder within 30 seconds of seeing the lightning.
 - (2) You hear thunder but do not observe lightning.
 - (3) You receive indications from a properly operating lightning detection system that lightning is occurring within 6 miles.
 - (4) You receive an SMG-issued JSC *lightning alert* per subparagraph b below.
- b. The following apply to JSC lightning alerts that you may receive via JENS email or by phone or that you see on NASA CCTV [closed circuit television] Channel 18:
- (1) The SMG issues a JSC Lightning Alert when lightning is occurring or imminent within 6 miles of JSC.

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- (2) An SMG lightning alert ends 30 minutes after the last lightning strike within 6 miles of JSC is detected.
- (3) This service is available Monday through Friday from 8:00 a.m. to 4:00 p.m. The service is not available on federal holidays.
- c. If lightning is occurring in the JSC area, take the following steps immediately:
 - (1) Suspend all outdoor activities, including construction and landscaping work, and move indoors if possible.
 - (2) Move to a protected location. JSC buildings that are occupied as daily work areas (office buildings and laboratories) can be considered to be protected safe locations during a lightning event. If you cannot safely reach an office or a laboratory building, a metal enclosed vehicle with the windows rolled up will provide better protection than being outdoors.

NOTE: It is a misconception that lightning always strikes the highest object in an area. If you are walking near a building while lightning is occurring, you are at just as much risk as someone working on the roof of the building.

Although your safety is significantly improved by being inside an office or a laboratory building, be aware that even in these “protected locations,” injuries could occur if lightning should strike.

Some areas that provide no additional lightning safety to individuals are carports, rain shelters, the pavilions at the Gilruth Center, softball field dugouts, golf or “Cushman” carts, eaves or awnings around buildings, trees, fences, light poles, and automobiles with nonmetallic tops.

- (3) Stay out of direct contact with plumbing, piping, window frames, or other metallic objects. You may continue to use phones and computers because they are isolated. If you are in an automobile, stay away from any metal in the vehicle.
- (4) Monitor weather conditions.
- d. You may resume activities when any of the following criteria are met:
 - (1) You have heard no thunder for 30 minutes. The threat of lightning continues for a much longer period than most people realize. Wait at least 30 minutes after the last clap of thunder before leaving a protected location.
 - (2) The JSC SMG cancels the *lightning alert*.

5.9.4 Wind policy

5.9.4.1 You shall follow these requirements during adverse wind conditions:

- a. After identifying potentially adverse wind conditions, supervisors or task leaders may:
 - (1) Consult the JSC Web for JSC Bldg. 30 Weather Observations. You can find JSC Bldg. 30 weather observations, including wind speed, at the following Web address:
<http://www.srh.noaa.gov/smg/bldg30.php>. (Note that the JSC Bldg. 30 sensors are approximately 172 feet (52 meters) above sea level.)

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<http://server-mpo.arc.nasa.gov/Services/CDMSDocs/Centers/JSC/Home.tml>.

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- (2) Use a handheld or crane-mounted anemometer to get direct readings for the specific worksite.
 - (3) Contact the SMG weather forecaster to get a more precise prediction for the specific job site. You need to make prior arrangements for this service.
- b. Operations may continue as long as local conditions (at the specific worksite) do not exceed the adverse weather limitations as specified in the "Wind Limitations Table."
 - c. As a supervisor or task leader of operations and facilities, you shall stop all operations and take appropriate actions when the wind speed or direction presents a hazard to the operation or facility.
 - d. The following table reflects the maximum wind speed work limitations. You shall never exceed the table without approval from the on-site supervisor or task leader and the Safety and Test Operations Division:
 - e. A supervisor or task leader may decide to start or complete a lift in progress based on wind direction, high mass or low sail area of load, and wind measurements taken at the worksite, but shall never exceed the maximum gust limit.
 - f. When equipment manufacturers recommend lower wind limitations than are shown in this table, you shall follow the manufacturer's recommended lower limits.

Wind Limitations Table		
<i>Average Wind Speed</i>	<i>Wind Gusts</i>	<i>Follow these limitations . . .</i>
20 mph	25 mph	Don't erect work platforms or lift personnel in buckets or cranes.
25 mph	28 mph	Stop all crane operations per NASA STD-1740.9, "Standard for Lifting Devices and Equipment."
34 mph	40 mph	Stop work on roofs, unprotected areas, or outside handrails.
40 mph	46 mph	Supervisors shall immediately check their area for unsecured items.
45 mph	50 mph	Immediately secure all loose or unanchored materials and equipment.

5.9.5 Tornadoes

5.9.5.1 You shall follow this policy at JSC:

- a. When the National Weather Service (NWS) issues a tornado watch for Harris or Galveston County, which indicates conditions are favorable for forming tornadoes, outdoor construction work may continue; however, you shall secure equipment, supplies, and debris at outdoor work areas to the greatest extent possible.
- b. When the NWS issues a tornado warning for Harris or Galveston County, which indicates tornadoes have been sighted or indicated by radar in the warning area, you shall:
 - (1) Be prepared to take cover if a tornado threat to JSC is imminent.

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(2) Close window coverings.

c. When the SMG issues a tornado warning for JSC, indicating a tornado is an imminent threat to JSC, you shall:

(1) Take cover immediately.

(2) Stop all outdoor work immediately, and take shelter in inner hallways or other safe locations in nearby buildings, closing all doors.

(3) Stay in these safe locations until an “all clear” is announced.

NOTE: The SMG forwards all watches and warnings to employees via JENS. You will see this information via a JENS email or the scrolling banner on the JSC CCTV Channel 3.

NOTE: When the SMG issues a tornado warning for JSC, the JSC Emergency Operations Center activates the Emergency Warning System (EWS) and a “whoop” or high to low tone will sound. The EWS will announce an “all clear” as a solid “wail” sound.

5.9.6 Excessive heat advisories

5.9.6.1 You shall follow this policy if an excessive heat advisory is issued at JSC. SMG relays NWS heat advisories that are issued for Harris County via JENS. You can also check the most current heat index at <http://www.srh.noaa.gov/smg/bldg30.php>.

a. Outdoor construction work may continue. As a supervisor, you shall:

(1) Be aware of the increased risk of heat-related illness to your workers.

(2) Make sure that adequate fluids (water, etc.) are available to employees at the outdoor location.

(3) Provide employees with a means to get out of the heat and reduce their accumulated heat load.

(4) Make every effort to schedule work during early morning hours when air temperatures are the lowest.

b. Outdoor exercise can lead to heat injuries when an excessive heat advisory is in effect. If you exercise outdoors at the Gilruth Center, heat advisories are updated and posted each weekday during the hotter months. If you choose to exercise outdoors during an excessive heat advisory, you need to be aware that:

(1) You are doing so at your own risk and against the advice of the JSC Occupational Health Branch.

(2) Exercising with a partner will allow someone to get help if a heat injury occurs.

(3) Consuming adequate fluids will reduce the risk of a heat injury.

(4) Understanding the symptoms of heat injury will allow you to stop and cool off before a heat injury actually occurs.

(5) Exercising during early morning hours, when air temperatures are the lowest, reduces the risk of heat injury.

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5.9.7 Group events

5.9.7.1 All outdoor group events shall have a Weather Safety Plan that is approved through the Safety and Test Operations Division. The following requirements apply for group events:

- a. All plans require:
 - (1) A person to decide whether the weather limits identified for the event have been exceeded and the event needs to be terminated. This person shall be present continuously for the event and not consume alcoholic beverages during the event.
 - (2) A person responsible for monitoring the weather for any changes that might require the event to be terminated.
 - (3) A means of notifying all participants at the event of weather-safety-related matters in a timely fashion.
 - (4) Operational weather limits for the event.
 - (5) A procedure for safely terminating the event if the weather limits are exceeded.
- b. Plans for Gilruth Center events shall remain on file at the Gilruth Center.
- c. Plans for events held away from the Gilruth Center (includes Ellington Field, the Sonny Carter Training Facility, the Child Care Center, or the general JSC area) shall remain on file in the Safety and Test Operations Division with information available to the on-call Occupational Safety Engineer.
- d. Most "routine" events held at the Gilruth Center may use one of two forms in Appendix D. If you use one of these templates and turn in the plan with other paperwork when you make a reservation at the Gilruth Center, no further approval is required.
- e. Some events will be better served by developing a unique plan due to the nature of the event. These plans shall also meet the requirements in subparagraph a above and require approval by the Safety and Test Operations Division.
- f. For events with 40 attendees or less, use the plan template in JSC Form 1316, Appendix D, which shall contain:
 - (1) A primary decision making official who shall be assigned for the entire length of the event and remain alcohol free.
 - (2) Protective areas and actions in the event of lightning or severe storms.
 - (3) Planned routes to protective areas.
 - (4) The specific notification process or signal to take protective measures and issue an "all clear" notice.
 - (5) Planned sources of weather information. In addition to visual assessments (30-30 rule), weather information sources shall include *at least two* of the following: Internet, All-Hazards Weather Radio, handheld lightning detector, and/or continuous contact with NWS or private weather service.

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- g. For events with more than 40 attendees, use the plan template in JSC Form 1317, Appendix D, which shall contain:
- (1) A primary and a back-up decision making official.
 - (2) A weather watcher or reporter.
 - (3) One safety warden for every 100 attendees to ensure that everyone receives safety notifications and instructions from responsible officials.
 - (4) Protective areas to house all attendees and actions in the event of lightning or severe storms.
 - (5) Planned routes to protective areas.
 - (6) The specific notification process or signal to take protective measures and issue an “all clear” notice.
 - (7) Planned sources of weather information. In addition to visual assessments (30-30 rule), weather information sources shall include *at least two* of the following: Internet, All-Hazards National Oceanic and Atmospheric Administration Weather Radio, handheld lightning detector, and/or continuous contact with NWS or private weather service
 - (8) The method of maintaining two-way communications between the primary and back-up decision makers, the weather watcher, and all safety wardens. Possible options are cell phones and handheld radios.

5.9.8 Remote operations

5.9.8.1 If you are working at remote locations (trade shows, field tests, recovery operations, etc.), you need to include adverse weather safety planning into the operational plans. Before starting operations, the task lead or senior individual on site shall determine the current environmental conditions for the specific area by:

- a. Assessing the surrounding conditions. Look for overcast or threatening clouds, rain, or indications of high winds. Listen for thunder. If you hear thunder, follow the steps in paragraph 5.9.3 of this chapter.
- b. Contacting the JSC SMG at least three-days before the operation, and providing them with the exact location of the remote operation, description of work to be done, when it will be done, and estimated length of the task. On the day of the operation, request from SMG information on existing or developing adverse weather conditions for the specific area of operations that could potentially move into the area during the operation. Request the weather forecaster’s recommendation for application of JSC lightning alert precautions or a high wind advisory. The SMG is available to monitor weather weekdays from 8:00 a.m. to 4:00 p.m. Central time (except federal holidays). You need to make prior arrangements for this service.
- c. If the activity is held at a remote location with access to an on-site weather organization (examples: Dryden Flight Research Center, military installations), coordinating with the remote site’s forecaster at least 1 week in advance of the operation to arrange weather support.
- d. Making the decision to proceed with the scheduled operation, and applying appropriate adverse weather precautions as directed in this chapter.

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- e. Periodically reassessing conditions. Monitor weather instrumentation, monitor weather radios, and request updates from the SMG as necessary. Remember: If you can hear thunder, you are already at risk for a lightning strike.

5.9.9 Responsibilities for adverse weather planning

- a. As a *first-level* or *line manager*, you are responsible for taking necessary actions to:
- (1) Make sure the requirements of this chapter are followed in your functional areas.
 - (2) Monitor weather observations and forecasts when your organization is engaged in activities subject to increased risk during severe weather to ensure safe operating limits are not exceeded.
 - (3) Make sure personnel under your supervision are trained and knowledgeable in the specific actions they are required to take when they are notified or become aware of pending or actual adverse weather conditions.
 - (4) Make sure that personnel under your supervision understand that no adverse action will be taken against them for exercising personal options relating to weather safety. Supervisors and other persons in positions of authority shall never require an individual to be exposed to a potential weather hazard to attend meetings or do other work.
- b. As a *contractor safety representative*, you are responsible for working with line managers to make sure all personnel are trained and knowledgeable in the specific adverse weather actions they are required to take.
- c. As a *facility manager*, you are responsible for making sure that all new and ongoing activities within the facility have appropriate adverse weather plans and that areas requiring evacuation during adverse weather are identified.
- d. As a *contracting officer* or *technical representative*, you are responsible for making sure that JSC contractors understand and follow NASA and JSC contract requirements for adverse weather safety and planning.